Service Manual

KT76

KT88

ENSONIQ™

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NOTES

IMPORTANT THINGS TO KNOW ABOUT THE KT-76/KT-88

As with every ENSONIQ product, all KT service will be handled through the ENSONIQ Module Exchange Program. Rather than diagnose and exchange individual components, you will replace complete modules. We feel that this is the most time and cost effective method of repair, both for you and your customers.

About this manual: The instructions in this manual are for both the KT-76 and the KT-88 unless otherwise noted.

Known Areas of Concern

Those items marked with a ☞ are known areas of concern, other items are important things to know about the KT.

☞ The KT Is made out of aluminum extrusions and steel. **There are very sharp edges inside the KT- Be careful not to cut yourself when working inside a KT.**

☞ The KT is a heavy instrument. **Whenever possible, two people should lift or carry a KT.**

Operating System (O.S.) Versions

The KT O.S. is contained entirely on EPROM chips installed in sockets on the KT main board. Any O.S. changes require changing the O.S. EPROMs. If an O.S. change is necessary, an update kit will be made available for you to order from ENSONIQ customer service.

☞ Some KT main boards may have EPROM sockets that have more holes than are required by the O.S. EPROMs. The KT O.S. EPROMs should always be justified to pin one on the chip and the socket.

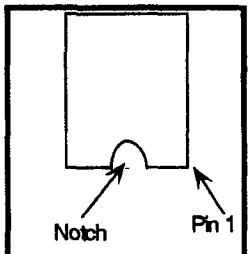


Figure 1 - Locating pin 1

Software Notes

Often a customer may perceive a software problem with their unit as a hardware problem. The following information is included to help you identify a symptom that may be a software problem.

The following items are known bugs in KT-76 version 1.01:

The KT can wake up playing no sound at all from the keyboard, and ignoring the first front panel button press. This does not happen in all units. It will always happen if a KT is powered on with a key held down.

WORKAROUND: Press any front panel button. All subsequent button presses will work, and the keyboard will now make sound.

MIDI Program Change/Bank Select transmission/reception does not all work as documented in the KT-76 manual. It basically works like it did in the SQ/KS.

The following items are addressed in KT OS version 1.50

Sounds/Voice

Sounds using monophonic glide modes that have note memory misbehave when zoned on a track assigned to half of the keyboard and stacked with another track that is zoned to cover the other half of the keyboard.

When System/MIDI page 0, BEND=##H (i.e., a Held Pitch Bend range is selected), pressing the Sostenuto Pedal incorrectly disables pitch bending on any notes that are held when the pedal is pressed.

When playing sound r:ROM 32 (Satin El. Piano), it is possible to get the note droning in the background.

When a monophonic sound is selected, striking and holding a key at maximum velocity while pressing another key at minimum velocity causes a note to appear and drone.

When a single footswitch is connected, powering on KT-76 and playing keys yields no audio. Pressing footswitch, or selecting/editing a sound/preset remedies the problem.

Playing notes staccato, while pressing and holding another note (pressed all the way through its pressure range) and holding the sustain pedal down, causes a "trill" effect on any pressure mod applied to the staccato notes.

Many of the Electric and Acoustic Piano sounds are programmed with RESTRIKE TIME=7. As a result, playing the same note rapidly twice in a row with the sustain pedal down, and then instantly releasing the sustain pedal, causes one of the elements of the sound to ring on and decay unnaturally slowly.

Sequencer Play and Record

If you replace a sound on a Track while the sequencer is playing, when the Track loops back around to the beginning the correct original sound is reinstalled on the Track (as it should be), but the MIDI Program Number (Edit Track, screen 4) is not reset to the Program Number of the original sound on the Track.

It appears that sequencer playback of Sostenuto events does not make its way to the voice. While recording a Sostenuto event in a Sequence or Song, you can hear the Sost event, but, upon playback (even in Audition mode), it does not respond.

When Songs use Sequence effects, or when manually chaining sequences, there is a lag between one sequence playing and the next, even if the seqs use the same effect.

If the sequencer is playing a note, and MIDI In receives the same note, and the MIDI-In note-off comes first (before the note-off from the sequencer playback), the MIDI-In note-off may steal the KDR (key down record) from the sequencer playback, resulting in a note drone from the sequencer playback note.

After recording into KT-76 internal sequencer until memory message appears, then adding bars to sequence and re-recording (REPLACE mode) until second memory message appears, answering Yes to KEEP NEW TRACK crashes KT-76 with ERROR 138.

Sequence Selection/Editing

When an empty Song (one with no steps) is selected, using the GOTO function causes an Error 130 crash.

When saving a Seq/Preset (pressing Enter/Yes button or via "Save changes?" prompt), selected or stacked tracks are not saved.

Song Tracks are not being properly defined when selected.

Creating a large Seq (75% of Int Memory) and a small Seq, so that Free Seq Memory=001%, copying small Seq to

a new location causes Free Seq Memory to incorrectly show 116%. After this, selecting any Seq causes ERROR 130.

It seems that the Seq or Song SIZE value in the Sequence Info or Song Info commands doesn't completely represent all of the memory used up by a Seq or Song.

When a ROM Preset was originally created with the Make Default Preset function, trying to enter record on it incorrectly brings up the prompt to select a time signature.

The "Cut & Paste" feature of the Event Editor fails to retain last program change value when re-inserting the program change.

MIDI

KT-76 does not transmit Registered Parameter Select messages for Master Tune or Global Bend if System/MIDI mode is entered from Seq/Preset mode.

When System/MIDI, Screen 7, Controllers equals OFF, reception of incoming MIDI Pitch Bend is incorrectly still enabled.

When a Song is selected and KT-76 is in MULTI mode, incoming MIDI notes drone when KT-76 receives incoming MIDI Sustain Pedal messages.

KT-76 does not transmit a track's volume over MIDI when a track is selected.

Song Tracks incorrectly receive via MIDI on the Seq Track MIDI channels for the current Song Step. Song Tracks don't record data received via MIDI in MULTI mode, no matter what MIDI channel they are assigned to.

When in Select Sounds mode and MIDI Mode=OMNI, any MIDI Pan, Volume, Release, or Timbre messages received permanently affect all sounds selected in Sounds mode, and remain even after KT-76 is powered off.

When MIDI In=OMNI, POLY, or MONO-A, and Seq is recording (in ADD mode) a series of incoming MIDI program changes over an existing track, track sound correctly remains the same (ignored), but the effects of the incoming program changes are incorrectly heard on the track as they are received.

General MIDI

GM Sounds 49 and 50 (Strings) chop off the last notes played when retriggering the same notes, as though Restrike Time were set to zero.

The Sound that is displayed as assigned to Channel 1 in GM mode is wrong after selecting a song and re-entering GM mode.

In GM Mode, the Track Pressure mode is not being forced to OFF. As a result, the live keyboard is transmitting Pressure via MIDI from GM Mode.

Going into GM mode while playing the keyboard can result in stuck notes. The stuck notes are playing the sound that is assigned to Track 1 of the Song.

MIDI-Out note velocities are different (for the live keyboard) in Select Sounds Mode versus GM Mode. The maximum 127 velocities from live playing are occurring at a noticeably lower playing velocity in GM mode.

Power-up Reset, System Reinitialization, and GM panic (All notes off) do not set the 16 GM MIDI channels to Volume 100, as is spec'ed in the GM Standard. It sets them to something lower.

When in General MIDI mode, KT-76 does not seem to respond to MIDI Controller 11 (Expression) messages.

After power up, the first press of the GM button is ignored. This only happens when a single footswitch is plugged in.

When KT-76 is in GM mode and is receiving data, releasing the Transpose button incorrectly sends a Note Off message to all MIDI channels.

When MIDI Mode=OMNI, POLY or MONO-A, entering and exiting GM Mode (panic), or receiving a Reset All Controllers (controller 121) message via MIDI In, causes the following System/MIDI mode parameters to be reset to the following values: page 4 Base Channel Status=BOTH; page 5 Base Channel Pressure=CHANNEL. These values should not be affected by Reset All Controllers or by MIDI panic.

Card Storage

After Reinitialization, attempting to send an All Seq Sys-Ex dump that is larger than internal memory to b:CARD is ignored by KT-76 until you perform Erase Seq Memory command in b:CARD (even if b:CARD was already erased). This only happens with All-Seq dumps.

Saving the ROM Sequencer Bank through Sys-Ex and sending the Sys-Ex back to Card B causes a MIDI SYSEX ERROR message to be displayed.

The b:CARD sequencer Bank (and probably the a:CARD sequencer Bank, too) fails to receive data of a size larger than i:INT seq memory via MIDI Sys-Ex, unless the target card had been plugged into the card slot when KT-76 was powered on. If no card is in the card slot on power-on, incoming MIDI Sys-Ex will fail to write sequencer data to the card.

Inserting a non-write-protected card containing card Seq banks into the card slot, selecting a:CARD or b:CARD seq bank with the Bank button, then write-protecting the card, and then trying to create a new Preset by selecting a blank location, scrambles the display and causes an Error 130 crash.

Effects

With Edit Track, Output=DRY/FX-1/FX-2/FX-3/VOICE (not CNTRL-FX) for a TRACK, assign Pressure to modulate FX. The FX will incorrectly be modulated. Now, assign Mod Wheel to modulate FX. Moving the local Mod will incorrectly modulate the FX.

The Edit Track Output setting for Track 1 in the currently selected Preset/Seq/Song incorrectly controls FX modulation in Sounds Mode.

Display Items

Initializing, then pressing Replace Track Sound button, then Enter button, then Replace Track Sound button again, then Edit Seq/Preset button, shows an underline (_) in non-standard places on most pages.

The "Command Successful" message that is displayed after the "Press ENTER to Erase Seq Memory" command is run only shows for a split second, and it looks like a display glitch. Also, when the sequencer is running and KT-76 is in Select Seq/Preset mode, pressing the Bank button causes "Sequencer must be stopped" to be momentarily displayed, but not long enough to be read.

The context sensitive top line of the Erase Seq/Preset command is not updated to reflect the type of Seq/Preset (i.e., SEQ or PSET) being erased, if you perform the command twice in a row.

The context sensitive top line of the Erase Seq/Preset command is not updated to reflect the type of Seq/Preset (ie, SEQ or PSET) being erased, if you have both a Preset and a Seq in memory, and you INC/DEC within the command.

Transpose Feature

Pressing the transpose button while the sequencer is playing causes recorded notes to be briefly cut off.

When the Transpose Keyboard button is continually pressed and released and you play the keyboard and notes are decaying, there are lots of pops and clicks.

The following items are addressed in KT-76/88 Software Version 1.60:

Sounds/Voice

The default Standard Sound was displayed as <Default Program>; it is now <Unnamed Sound>. The default Drum Sound was also changed to Unnamed Drum Snd.

In r:ROM Sound 00 (KT Grand Piano), Voice 3 (Thump) only went to C8. All sounds with zoned voices now extend to the new D0#-F8 range.

When creating a default sound (Change SoundMode from a Drum Sound), all three Voices in the default Standard Sound incorrectly had their Key Ranges set to A0-C8. They now default to the new D0#-F8 Range.

The default Standard Sound (that is created whenever you use the ChangeSoundMode command from a Drum Sound) now has its Glide Time parameter default to a value of 00.

Presets/Sequences/Songs

There were -UNDEFINED- tracks in the ROM Presets, Seqs, and Songs. This could cause an Error 129 crash if a user got to an undefined track with the cursor buttons in Select Seq mode, then pressed Edit Sound and used the data slider. All ROM Presets/Seqs/Songs now have all 8 tracks defined.

All Tracks in all the ROM Presets, Sequences, and Songs have had their Edit Track key ranges widened to the new full range (D#0-F8).

Sequence Selection/Editing

Edit Track key range was widened to D#0-F8.

Display Items

When Keyboard Transpose LEDs showed any value (+1 to +5; -1 to -6), and KT was in any of the Key Range pages, display failed to update outside the A0-C8 range. The range has been widened to D#0-F8 for Edit Sounds (Output page 1) and Edit Track (page 2).

UNEXPECTED EVENT MESSAGES

Occasional unexpected event messages are not unusual, and unless they become chronic, they are not a cause for concern. It is important to realize that these messages are diagnostic in nature and do not necessarily indicate a problem. These messages were designed to help our software engineers in the development of the software, not as hardware diagnostics.

It is possible that chronic unexpected event messages could be caused by scrambled memory. Be sure to reinitialize the system before trouble shooting any further.

Software Messages

The following unexpected event messages could be caused by hardware problems or software errors:

Error #	Explanation
32 33	Effects Download Error. Indicates a problem with the ESP chip on the main board.
129 131 137	Indicates bad sequence data. Reinitialize and discard sequence data. Call ENSONIQ customer service for more details.
144	Buffer Overflow. If no MIDI cables are connected, unit might need Main Board.
195	Indicates bad sequence data. Reinitialize and discard sequence data. Call ENSONIQ customer service for more details.

Fuse Ratings

	UL rated fuses (100V, 120V, 240V)	IEC127 rated fuses (230V units only)
F1	1.0A Slow Blow	T1.0A
F2 and F3	3.0A	F3.15A
F4 and F5	1.0A	F1.0A

RAM and ROM Cartridges, Sequence memory expansion.

The card slot on the KT accepts industry standard Type 1 PCMCIA cards for RAM storage. There is no sequence memory expander kit for the KT keyboards. Sequence memory expansion is done via the PCMCIA slot only.

Although this PCMCIA slot can accept and format all sizes of Type 1 PCMCIA RAM cards, it can format them only to 512k bytes.

Data on PCMCIA cards formatted on devices other than the KT, such as a notebook PC, will not be able to be read by the KT. Data on PCMCIA cards formatted on a KT will not be able to be read by other devices.

512k PCMCIA RAM cartridges are available from ENSONIQ. PCMCIA ROM cartridges are available from ENSONIQ with sound and sequence data pre programmed on them.

Reinitialization

The KT is essentially a computer with its own O.S., RAM memory, and so on. Like a computer, it can lock up (stop operating) or glitch (behave erratically) if the RAM memory is corrupted by bad data.

This can happen if bad data is being accessed from a PCMCIA card, or if MIDI SYSEX data is corrupted. If the memory does get scrambled, it will be necessary to reinitialize the system.

Reinitialization causes all internal RAM memory to be erased, so periodic backing up of data is required to enable the user to restore the system.

Since scrambled data in RAM can cause problems that at first glance appear to be hardware-related, reinitialization is recommended as a first step in troubleshooting.

A given unit is likely to have data stored in it that is near and dear to the owner of that unit. It is highly recommended that the owner back up the RAM memory of the unit before reinitializing it.

IMPORTANT! Unplug all audio cables before reinitializing. The audio outputs may make a pop when reinitializing.

There are 3 methods for reinitializing the KT. The method you should try first is reinitialization from the front panel. If the system is so scrambled that the front panel isn't responding, try the System Reset Sequence. If the unit still doesn't respond after that, try the Hard Reset procedure.

TO REINITIALIZE FROM THE FRONT PANEL:

1. Save all Sound, Preset, and Sequence data (see the Storage Section).
2. Press the (EDIT SEQ/PRESET) button so that it is lighted.
3. While holding down the upper (9) button, press the lower (9) button. The display will read:

4. Press the (YES) button (the (ENTER) button acts as a "Yes" button to respond to questions on the display, and the (▽) button acts as "No").
5. After selecting Yes, the unit erases its memory and starts up just as it does when you turn the power on, and reinitialization is complete. The 80 i:INT sounds that are shipped from the factory are automatically restored back into the internal memory after reinitializing.

SYSTEM RESET SEQUENCE:

1. Turn the unit off and then on eight times. When you turn it on, it should be just long enough for you to see the display start to show characters. When you turn it off, it should be just long enough for the display to go totally dim. On most units a one second interval between off and on works well. For

example, you could count "off one thousand, on one thousand, off one thousand, on one thousand...". Sometimes you may need to experiment with the interval between "on" and "off".

2. The eighth time you turn the unit on, the unit should automatically reinitialize itself and show the wake-up screen.

If the front panel buttons still do not respond, try the Hard Reset procedure.

HARD RESET:

1. **Make sure the power is off and the power cord is disconnected from the unit.**
2. Short the positive (+) side of the battery to pin 2 (AGND) of J5 for a few seconds (see **Figure 1**).

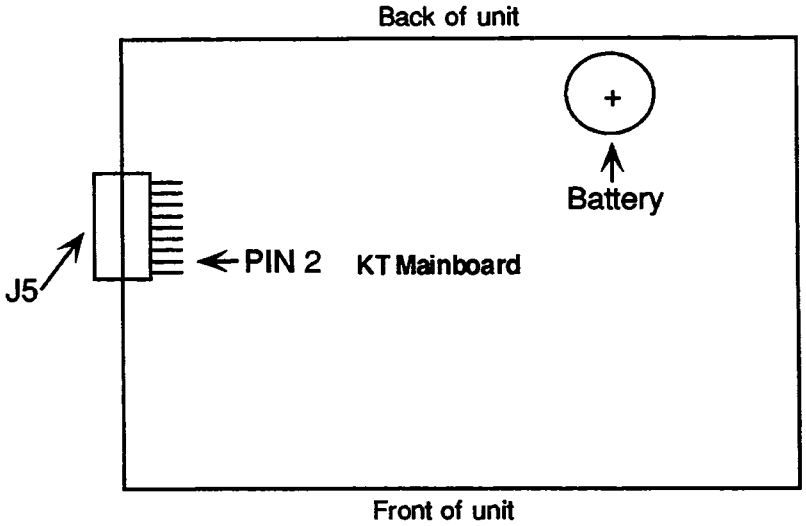


Figure 2- Hard Reset Locations

If the above methods do not return the system to normal operation, then there is a problem with one of the modules.

Mechanical Issues

- ☞ **Keypad/Display Board:** Some early units may exibit a problem with intermittent button response. This could be a problem with a chemical residue in the switches, or a button key carrier that is out of place. In either case, the Keypad/Display Board should be replaced.

- KT Case (Avoid Stripping Screws): Care should be taken when assembling or disassembling any part of the KT. **Avoid over tightening screws when repairing a unit! Use no more than 8 inch/lb. of torque when tightening any screw.** The KT case is made of aluminum extrusions and steel. Some parts are held in place by screws that tighten into aluminum mounting rails that are part of the case. When replacing any of these screws, it is possible to over-tighten the screws and strip out a hole.

- **High Retention Force Connectors** (Repair Technicians Label): Inside the KT is a warning/information label just for you. We wanted to let you know that we use high retention force connectors in the KT. This means it is very difficult to remove a connector by just pulling. We recommend using a scribe, screwdriver, or similar object when disconnecting cables. **Please don't pull on the wires!**

We have found that some units develop further problems once a module has been replaced. This may be the result of improper handling of cables. We recommend removing cable connectors using the angled end of a scribe (see below).

Figure 3 - Scribe

Scribes can be found in the following catalogs:

- Techni-Tool catalog 49, page 185, part number 400PR144.
- Newark catalog 112, page 1115, part number 76-1510.

How the KT works

The KT is a very powerful computer based on ENSONIQs OTTO sound processor and a Motorola 68020 microprocessor. To generate 64 voices of polyphony, the KT uses 2 OTTO processors. The microprocessor, sound processors, effects processor, system RAM and ROM, and associated control circuitry for KT are located on one board, the main board. The A/D converter, audio output amplifiers, and the muting circuitry, and all of the jacks, are on the jack board. There is a pressure board to read the keyboard pressure strips, and it has the buffers for the pitch and modulation wheel inputs on it. There is a power supply board, and a keypad/display board.

Figure 3 is a block diagram depicting the main components of the KT.

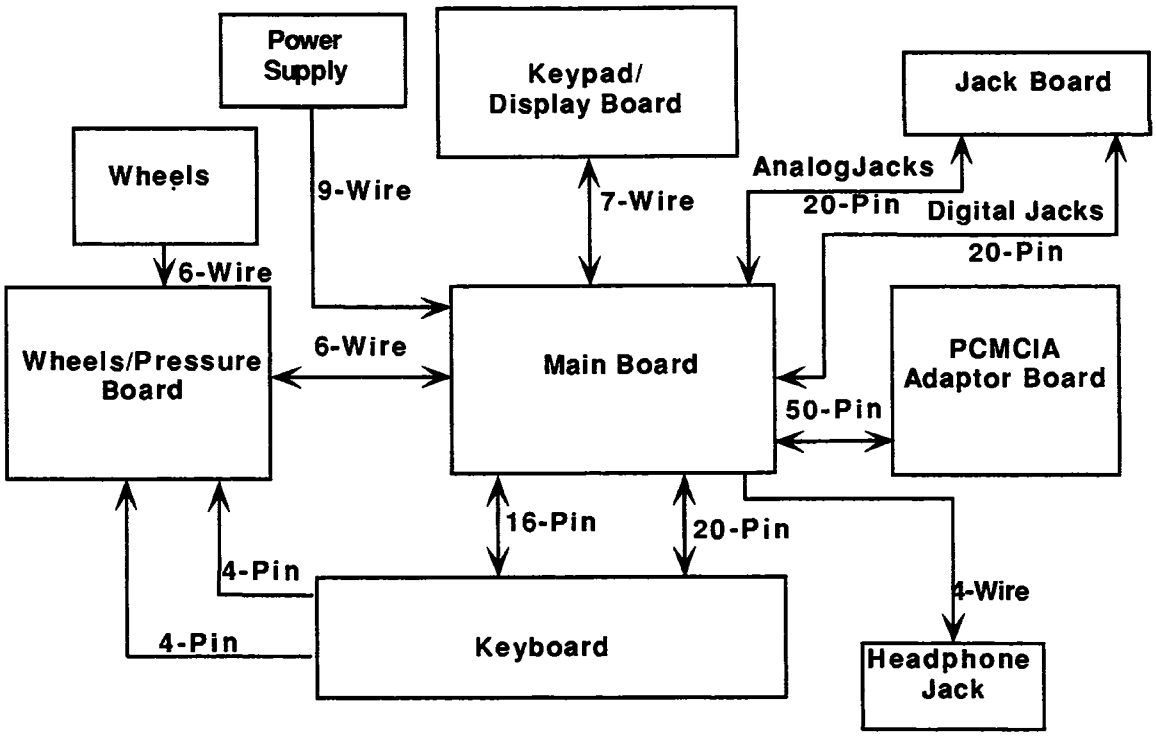


Figure 4 - KT Block Diagram

TROUBLESHOOTING

Often the faulty module in a KT can be determined through normal use. Sometimes it is difficult to isolate the problem. When troubleshooting a KS, always make sure there is no PCMCIA cartridge plugged in that may be causing problems, and be sure no devices are connected to the MIDI ports. It is also important to be sure the KS is plugged into a properly grounded outlet.

The following pages include troubleshooting information.

CHECKING THE POWER SUPPLY

Some KT problems may be related to a faulty power supply, transformer or line filter. You should check these before troubleshooting the rest of the unit. **Measure continuity across all the fuses to make sure they are not blown.**

Make sure all the cable connections are secure and correct. Plug the KT in and turn it on. After the unit has warmed up for five minutes, check the voltages at the points shown. It is normal for line voltage to vary +/- 10%. If the voltages fall outside of allowable limits, follow the procedure described under TESTING THE POWER SUPPLY UNLOADED (PAGE 12).

AC LINE VOLTAGE CHECK POINTS

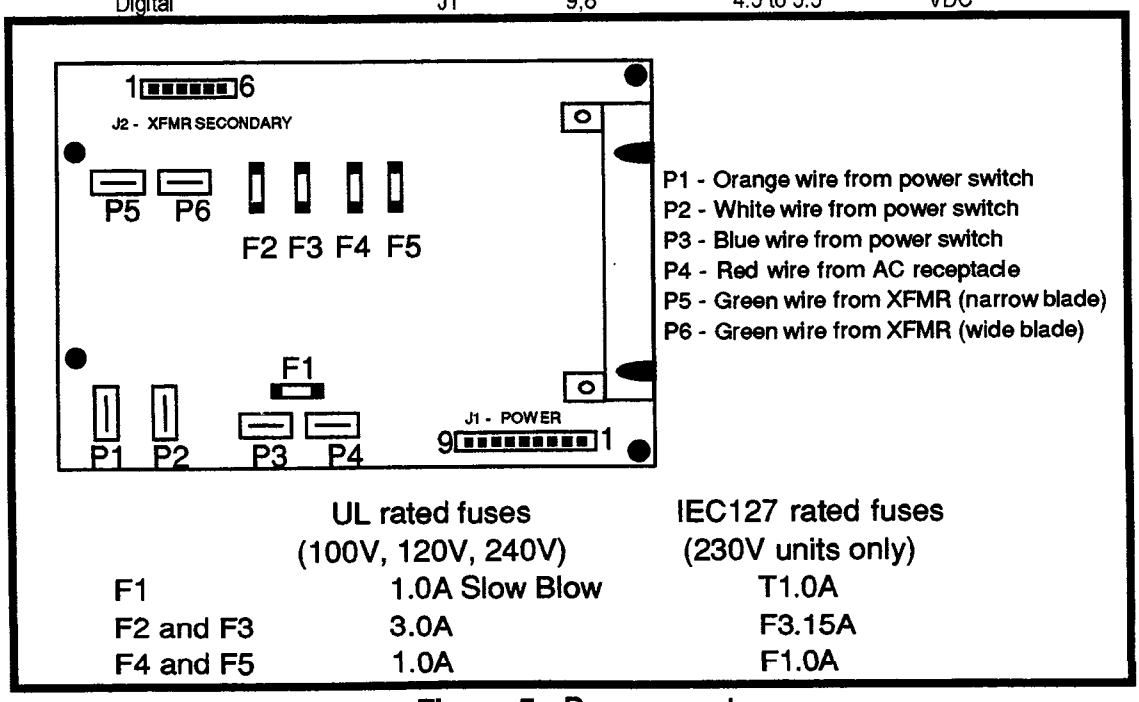
With the power switch in the OFF position, the proper AC line voltage should be read at the AC line input jack between the Live line lug (red wire) and the Neutral line lug (black wire).

With the power switch in the ON position, the proper AC line voltage should be read at the power switch between the switch Hot lug (white wire) and the switch Neutral lug (orange wire).

POWER SUPPLY VOLTAGE CHECK POINTS

Below are the voltage ranges for proper operation of each fully loaded supply and the pins to read across with the voltmeter. It is normal for the voltage to vary +/- 10%.

Designation	Where Used	Connector	Pins + -	Allowable Range	Units
DAC	Digital	J2	1,3	8.25 to 11.77	VAC
AAC	Analog	J2	4,6	16.5 to 23.5	VAC
-15.6A	Jack Board	J1	1,2	-14.0 to -17.1	VDC
+15A	Jack Board	J1	3,2	13.5 to 16.5	VDC
+VD	+5A/D, Display	J1	5,4	10.8 to 13.2	VDC
+5D2	Digital	J1	7,8	4.5 to 5.5	VDC
+5D1	Digital	J1	9,8	4.5 to 5.5	VDC


1 6
J2 - XFMR SECONDARY
P5 P6
F2 F3 F4 F5
F1
P1 P2 P3 P4
J1 - POWER
9 1
P1 - Orange wire from power switch
P2 - White wire from power switch
P3 - Blue wire from power switch
P4 - Red wire from AC receptacle
P5 - Green wire from XFMR (narrow blade)
P6 - Green wire from XFMR (wide blade)

	UL rated fuses (100V, 120V, 240V)	IEC127 rated fuses (230V units only)
F1	1.0A Slow Blow	T1.0A
F2 and F3	3.0A	F3.15A
F4 and F5	1.0A	F1.0A

Figure 5 - Power supply

TESTING THE POWER SUPPLY UNLOADED

If the power supply readings exceed the specified tolerance, it is possible that a component on another board is defective and causing the problem. In this case, you should test the power supply unloaded before proceeding. This involves turning the unit off, unplugging circuit boards from the power supply one at a time, and measuring the power supply again to see which board might be causing the problem. Use the following two flow charts to guide you through this process.

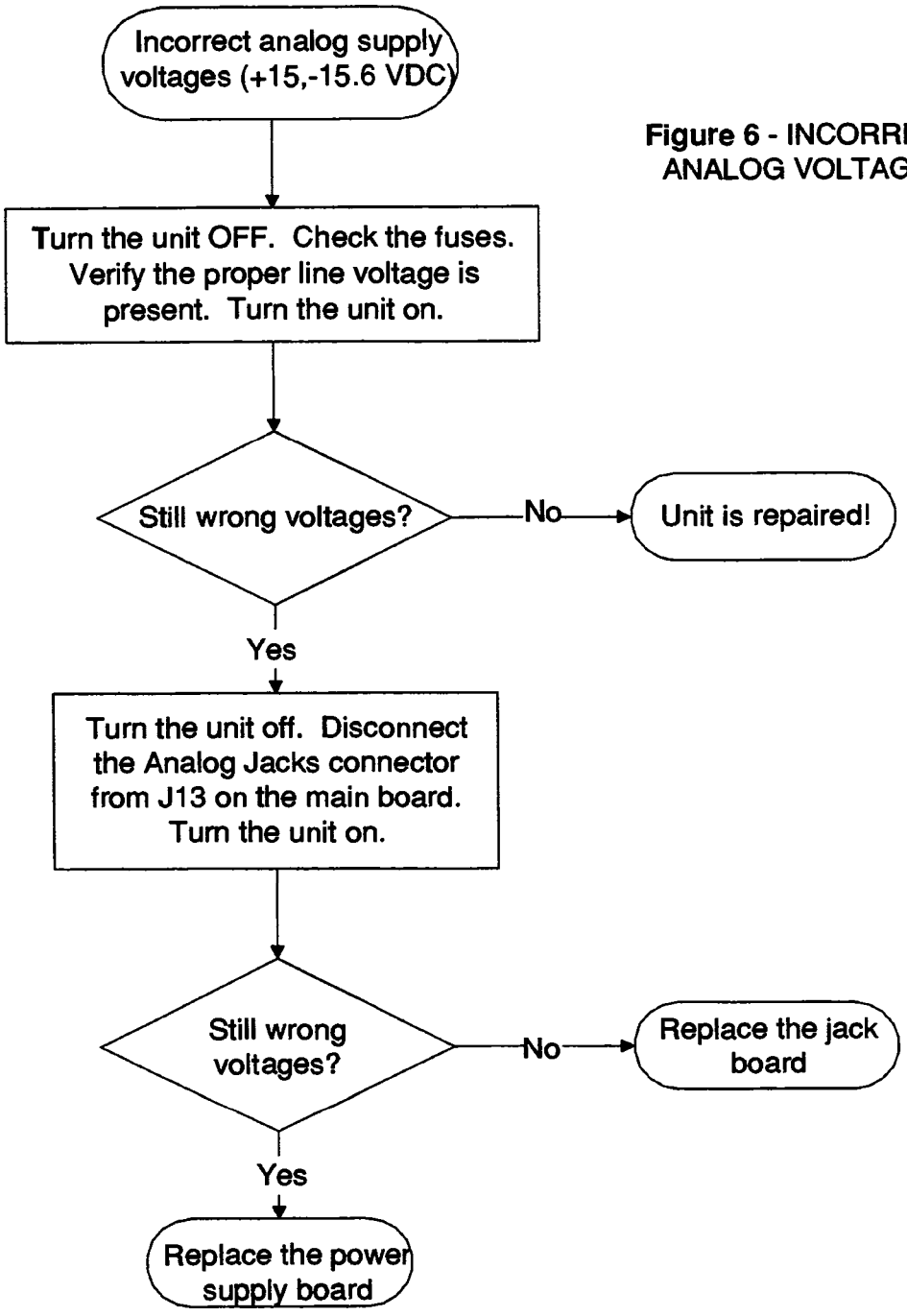

Incorrect analog supply voltages (+15,-15.6 VDC)
Turn the unit OFF. Check the fuses. Verify the proper line voltage is present. Turn the unit on.
Still wrong voltages?
No
Unit is repaired!
Yes
Turn the unit off. Disconnect the Analog Jacks connector from J13 on the main board. Turn the unit on.
Still wrong voltages?
No
Replace the jack board
Yes
Replace the power supply board

Figure 6 - INCORRECT ANALOG VOLTAGES

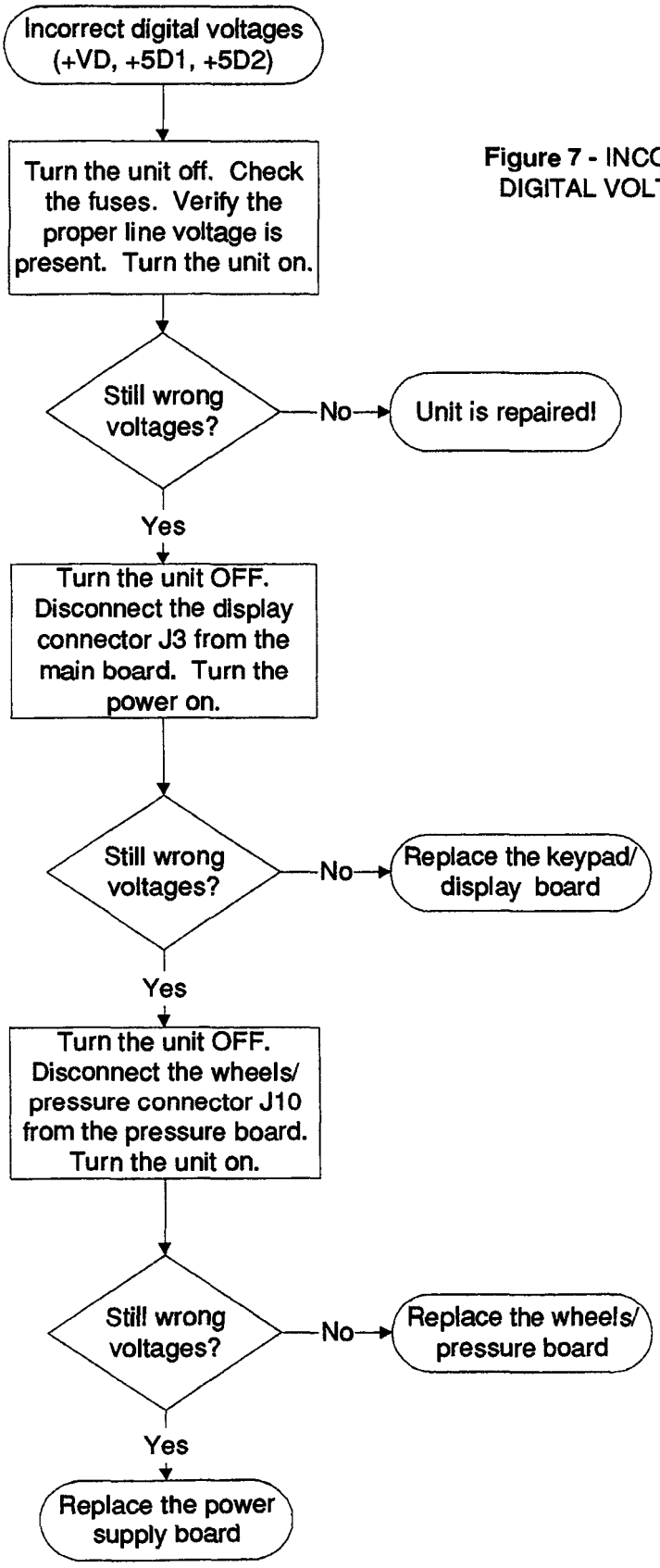

Incorrect digital voltages (+VD, +5D1, +5D2)
Turn the unit off. Check the fuses. Verify the proper line voltage is present. Turn the unit on.
Still wrong voltages?
No
Unit is repaired!
Yes
Turn the unit OFF. Disconnect the display connector J3 from the main board. Turn the power on.
Still wrong voltages?
No
Replace the keypad/ display board
Yes
Turn the unit OFF. Disconnect the wheels/ pressure connector J10 from the pressure board. Turn the unit on.
Still wrong voltages?
No
Replace the wheels/ pressure board
Yes
Replace the power supply board

Figure 7 - INCORRECT DIGITAL VOLTAGES

LOW BATTERY MESSAGE

There are two low battery warnings that may appear on the KT display. If the internal RAM backup battery is low, the display will read:

When the PCMCIA card battery is low the display will read:

When the Card Battery message appears, the KT does not have to be serviced. Card batteries are easy to change and can be done by the end user.

When the Main Battery message appears, that can be an indication of either a drained battery, or a problem with the main board

To check the battery go to the analog test page on the KT:

Press (EDIT SEQ/PRESET) then while holding down top button (9) quickly press bottom button (0).

The screen shows "Analog Tests". Press bottom button (2).

The value next to "Bat=" should read between 29 and 50. If the value is outside of this range, it may mean only that the unit is confused and needs to be reinitialized. Go to page 7 and reinitialize the unit. Check the battery value again.

If the value is still outside the specified range, turn the unit off, disconnect all cables, open the unit and measure the battery. If the battery voltage is below 2.7 volts DC, replace the battery. If the battery voltage is 2.7 volts DC or above, replace the main board.

Battery Cautions

In order to comply with safety agency requirements, translations of the warning on the battery label inside the KT are listed here.

English CAUTION!
Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.

Denmark ADVARSEL!
Litiumbatteri - Eksplosionsfare ved fejlagtig handtering. Udskiftning ma kun ske med batteri af samme farbrikar og type. Lever det brugte batteri tilbage til leverandø ren.

Finland VAROITUS!
Paristo voi rä jä htä ä , jos se on virheellisesu asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppin. Hä vitä kä ytetty paristo valmistajan ohjeiden mukaisesti.

Sweden VARNING!
Explosionsfara vid felaktig batteribyte. Anvä nd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera anvä nt batteri enligt fabrikantens instruksjon.

DISTORTED OUTPUT

The KT main board has the OTTO chips and the ESP chip on it. These two chips are the most likely culprits of distortion in the KT output.
The KT jack board has the digital to analog converter on it, so in some cases the source of distortion could be the jack board.
Distorted output on a KT usually indicates a problem with the mainboard. If a customer complains of distortion on just the left or right side though, there could be a problem with the jack board.

Perform the following test to determine if there is a faulty OTTO of ESP chip. If you hear distortion on some, but not all, of the following steps, replace the KT main board. Distortion on all steps could indicate the Jack board.

Connect the KT to an audio amplifier.

Press (EDIT SEQ/PRESET) then while holding down top button (9) quickly press bottom button (0).

The screen shows "Analog Tests". Press bottom button (7).

The screen shows "SysEX Tests". Press bottom button (0).

The screen shows "Otto 1 Sine Test Channel 00".

Listen to the output of the KT for any distortion. Press bottom button (0) to listen to OTTO 1 channel one, then press bottom button (0) again to listen to OTTO 1 channel 2.

Press bottom button (1).

The screen shows "Otto 2 Sine Test Channel 00".

Listen to the output of the KT for any distortion. Press bottom button (1) to listen to OTTO 2 channel one, then press bottom button (1) again to listen to OTTO 2 channel 2.

Press bottom button (3).

The screen shows "ESP 1 KHz @ 0dB". Listen to the output of the KT for any distortion.

Note: To mute the KT output during this test, press the (BANK) button. To exit the test press bottom button (9)

If all of the above steps are distorted, try replacing the main board first. If the unit still has distorted outputs after changing the main board, replace the jack board.

DISPLAY SELF-TEST MODE

When the keypad/display is receiving power from the main board but is not in proper communication with the main board, the KS–32 enters **Self-test mode**. In Self-test mode, the display remains blank until you press the buttons on the front panel. Pressing various front panel buttons will cause the display to show "BUTTON," then a number.

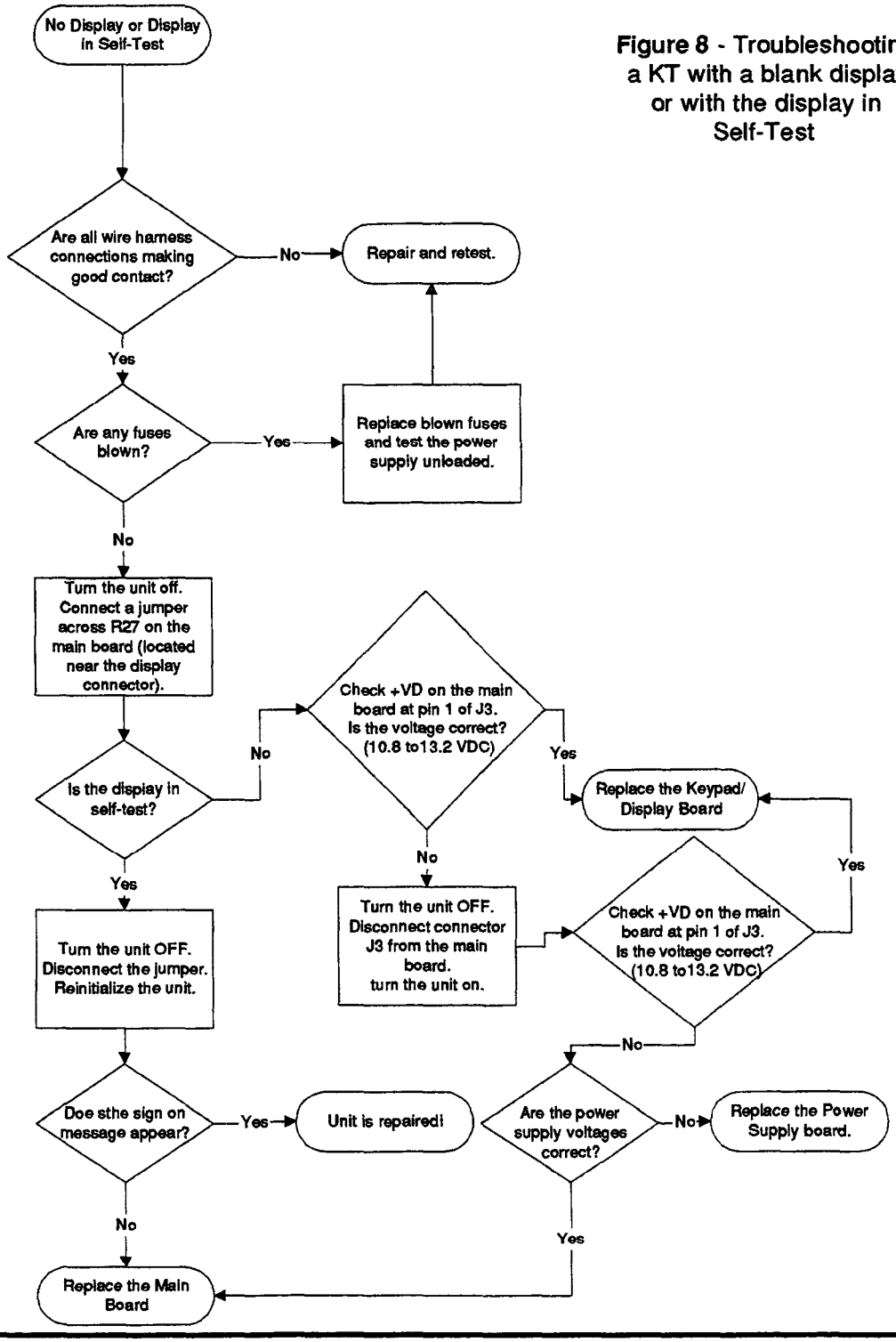

No Display or Display in Self-Test
Are all wire harness connections making good contact?
No
Repair and retest.
Yes
Are any fuses blown?
Yes
Replace blown fuses and test the power supply unloaded.
No
Turn the unit off. Connect a jumper across R27 on the main board (located near the display connector).
Is the display in self-test?
No
Check +VD on the main board at pin 1 of J3. Is the voltage correct? (10.8 to13.2 VDC)
Yes
Replace the Keypad/ Display Board
No
Yes
Turn the unit OFF. Disconnect the jumper. Reinitialize the unit.
Turn the unit OFF. Disconnect connector J3 from the main board. turn the unit on.
Check +VD on the main board at pin 1 of J3. Is the voltage correct? (10.8 to13.2 VDC)
Yes
No
Doe sthe sign on message appear?
Yes
Unit is repaired!
Are the power supply voltages correct?
No
Replace the Power Supply board.
No
Yes
Replace the Main Board

Figure 8 - Troubleshooting a KT with a blank display or with the display in Self-Test

KT KEYBOARD

The KT uses the same keyboard as the KS-32 and TS-12 that has "bubble" switches, the KT-88 keyboard is only different in the number of keys. Instead of mechanical switches, this keyboard has a molded rubber bubble under each key. The keyboard circuit board has conductive carbon contacts printed on it (which appear as small black strips under each key). Each rubber bubble also has small conductive carbon dots printed on the inside. The bubbles are made in strips which attach to the circuit board using small nubs. The nubs on a strip are pushed through holes in the circuit board, in order to hold the strip in place.

As a key is pressed, it forces the bubble down until the carbon dots on the bubble hit the carbon contacts on the circuit board. This completes the circuit. The circuit has two contacts per key, a back contact and a front contact. The back contact closes first when a key is pressed, then the front contact closes. We measure the amount of time between when the back contact closes and when the front contact closes. This tells us how fast the key was hit, making the keyboard "velocity-sensitive". In other words, we can tell how hard the musician is playing and can adjust the volume and brightness of the sound in response to the playing style. Each bubble switch also has a diode in series with it for proper circuit operation.

Although bubble switches are more reliable than mechanical switches, there are still many things that can go wrong with this keyboard. If the bubble switches don't switch in the proper order (first the back contact, then the front contact) or if the switches don't make clean contact, several problems can occur. These include:

- Keys that don't sound at all
- Erratic keys that "chatter" as they are played, held or released
- Keys that sound much louder than other keys
- Keys that sound much quieter that other keys

These problems can be caused by several things, including:

- Open or shorted traces on the circuit boards
- Bad or dirty carbon contacts on the circuit boards
- Bad or dirty carbon contacts on the bubbles
- Torn or otherwise damaged bubbles
- Bubble strips that are installed backward
- Interference between the key and the bubble (such as foreign material trapped between the key and the bubble)
- Improper alignment between the key and the bubble
- Bad diodes

Usually failures will fall into two categories; either one key is bad, or a group of keys is bad. If a group of keys is bad, all the keys may be grouped together (usually a group of eight) or they may be spread across the keyboard (usually every eighth key).

If keys fail in a group of eight or every eighth key fails, the problem is most likely an open or shorted trace on the circuit board or a problem with the keyboard processor board (that is mounted to the bottom of the keyboard). Check this first and repair as shown on the following two pages.

If only one key is bad (or if groups of keys are bad but not in groups of eight or every eighth key), the problem could be any of the above. The first thing to do is remove the key and see if there is anything obviously wrong with the bubble:

- **Look for damage to the bubble itself.**
  If the bubble is damaged, the circuit board must be removed so the strip can be replaced.
- **Check that the bubble strip is seated flat against the circuit board.**
  If the strip is improperly seated, use an appropriate tool (a straightened paper clip works well; don't use a sharp tool as it can puncture the rubber strip) to force the nubs on the strip into the holes on the circuit board. The strip should lay flat against the circuit board.
- **Check that the bubble isn't backward. If installed correctly, the deeper of the two bubble contacts should be at the rear of the keyboard.**
  If the strip is in backward, remove the circuit board, pull the strip off the circuit board, turn it around and reinstall it.
- **Remove any foreign material caught between the bubble and the key.**
- **See if the plunger on the key makes proper contact with the top of the bubble.**
  If the plunger on the key forces the bubble down unevenly (with one side of the bubble being much higher than the other side), loosen the screws that hold the circuit board in place and slide the circuit board over slightly to better align the key and the bubble, then re-tighten the screws.
- **Check that both diodes for that key are inserted properly (the banded end of all diodes should face the same way).**
  If a diode is in backward, the circuit board must be removed and the diode must be unsoldered, reversed and re-soldered.
- **Check that both diodes for that key are working properly.**
  Select the "diode check" setting on an ohmmeter and test the diodes. The diode should conduct when the negative (black) lead of the ohmmeter is on the cathode (banded) end of the diode and the positive (red) lead of the ohmmeter is on the anode (unbanded) end of the diode. The diode should not conduct when the negative (black) lead of the ohmmeter is on the anode (unbanded) end of the diode and the positive (red) lead of the ohmmeter is on the cathode (banded) end of the diode. If a diode is bad, replace it with a 1N914B diode.

If there is no obvious problem, remove the circuit board:

- **Examine the circuit board for short circuits.**
  These are usually caused by solder bridging. Touch up any shorts with a soldering iron and/or razor knife.
- **Look for open traces.**
  These usually occur at the break-away points along the edge of the board and near the connectors. Solder a wire jumper in place to fix any broken connections.
- **Remove the bubble strip and clean both the circuit board contacts and the bubble contacts with alcohol and a cotton swab.**
  Allow them to air dry before putting the bubbles back on the circuit board.

  If after all this the keyboard still doesn't work properly, replace the entire keyboard assembly.

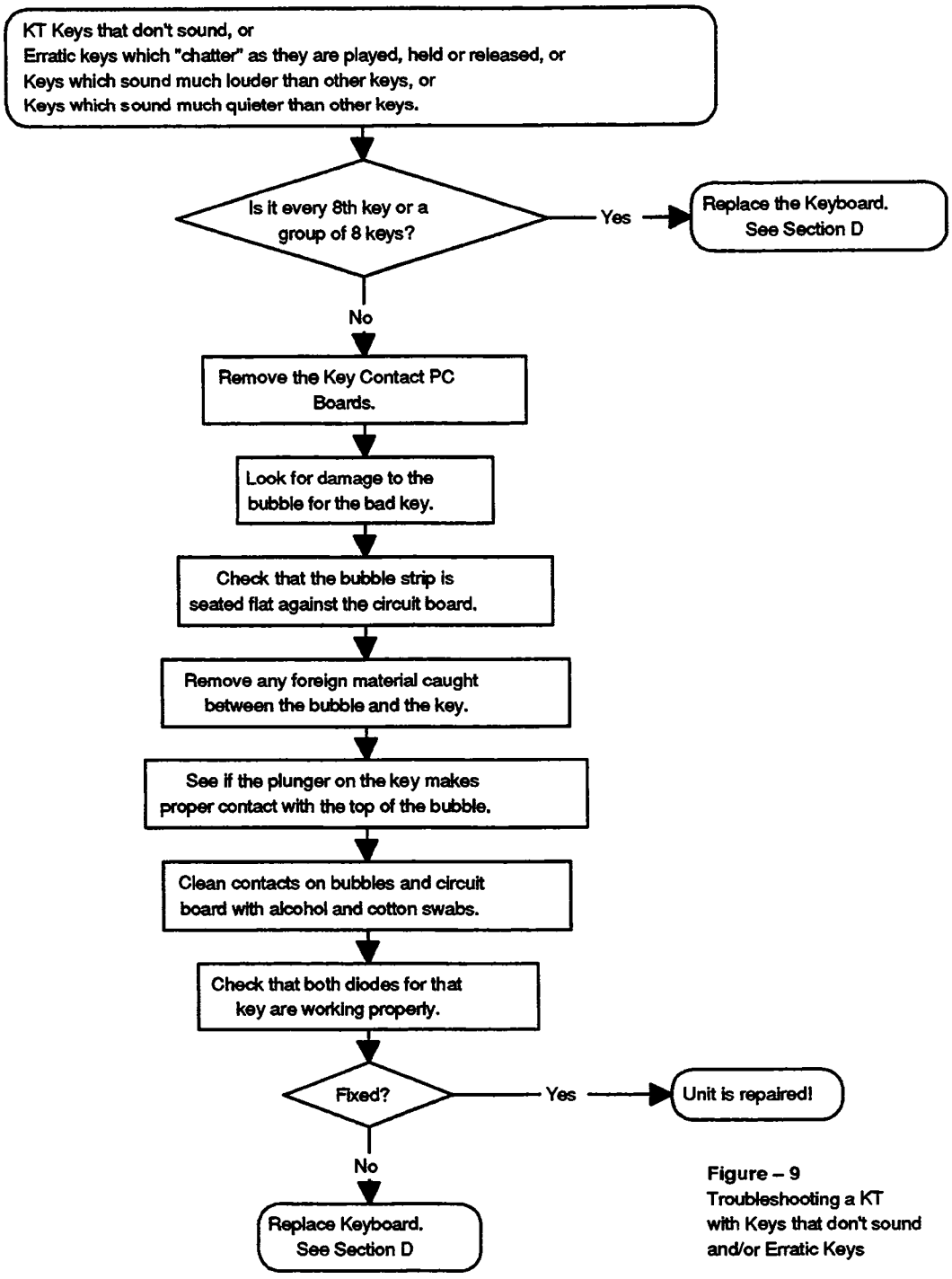

KT Keys that don't sound, or
Erratic keys which "chatter" as they are played, held or released, or
Keys which sound much louder than other keys, or
Keys which sound much quieter than other keys.
Is it every 8th key or a group of 8 keys?
Yes
Replace the Keyboard. See Section D
No
Remove the Key Contact PC Boards.
Look for damage to the bubble for the bad key.
Check that the bubble strip is seated flat against the circuit board.
Remove any foreign material caught between the bubble and the key.
See if the plunger on the key makes proper contact with the top of the bubble.
Clean contacts on bubbles and circuit board with alcohol and cotton swabs.
Check that both diodes for that key are working properly.
Fixed?
Yes
Unit is repaired!
No
Replace Keyboard. See Section D

Figure – 9
Troubleshooting a KT with Keys that don't sound and/or Erratic Keys

The KT keyboard, like the KS-32 and TS-12, has mono pressure response. This allows a modulation effect to increase as you press harder on a key. Pressing harder on any key will affect all other keys. To produce mono pressure, two pressure sensitive strips are inside the keyboard assembly. Pressing on a key exerts a downward pressure on the strips. Two strips are used because of the large 76-note span. The signals from the two strips are combined by the mono pressure circuit that resides on the keyboard processor board that is mounted to the bottom of the 76-note keyboard near the wheel assembly. A 20-pin cable carries the combined signal over to the digital board. Note that it is normal for pressure response to vary depending on the number of keys being pressed.

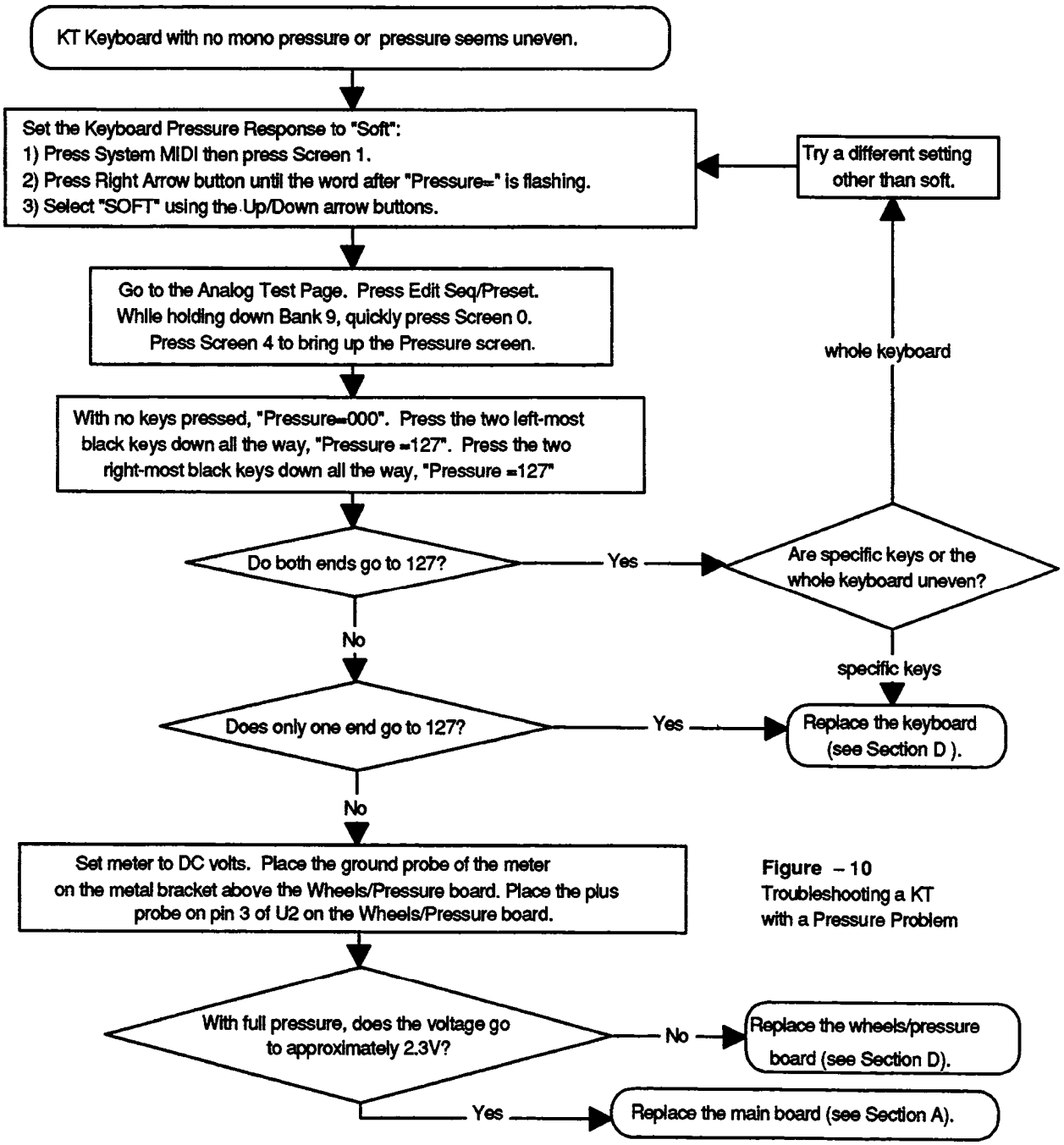

KT Keyboard with no mono pressure or pressure seems uneven.
Set the Keyboard Pressure Response to "Soft":
1) Press System MIDI then press Screen 1.
2) Press Right Arrow button until the word after "Pressure=" is flashing.
3) Select "SOFT" using the Up/Down arrow buttons.
Try a different setting other than soft.
Go to the Analog Test Page. Press Edit Seq/Preset.
While holding down Bank 9, quickly press Screen 0.
Press Screen 4 to bring up the Pressure screen.
whole keyboard
With no keys pressed, "Pressure=000". Press the two left-most black keys down all the way, "Pressure =127". Press the two right-most black keys down all the way, "Pressure =127"
Do both ends go to 127?
Yes
Are specific keys or the whole keyboard uneven?
No
specific keys
Does only one end go to 127?
Yes
Replace the keyboard (see Section D).
No
Set meter to DC volts. Place the ground probe of the meter on the metal bracket above the Wheels/Pressure board. Place the plus probe on pin 3 of U2 on the Wheels/Pressure board.
With full pressure, does the voltage go to approximately 2.3V?
No
Replace the wheels/pressure board (see Section D).
Yes
Replace the main board (see Section A).

Figure – 10
Troubleshooting a KT with a Pressure Problem

TEST PROCEDURES

The Following test procedures will insure a thorough testing of the KT and will help qualify customer complaints about: MIDI malfunctions, audio quality, wheel problems, foot switch or pedal problems, keyboard problems, and memory problems.

The KT should be connected to a stereo sound system. To do the following tests you need:

- a short MIDI cable
- a CV pedal (ENSONIQ CVP-1)
- a dual foot switch (ENSONIQ model SW 5 or SW10)

The KT is heavily software dependant, in many cases a KT that appears to be broken may simply need to be reinitialized. Please see page 1 for more information on reinitialization.

MIDI Test

a. Plug in audio cables to monitor the output of the KT, then connect the MIDI in to the MIDI out with the short MIDI cable.
b. Select the sound r:ROM 01 "Cool B-Three" and hold down a few keys.
c. While holding down a few keys, disconnect one end of the MIDI cable.
d. When you release the keys, the notes you were holding down should sustain.
e. Turn the unit off then back on and check that the unit plays normally.
*** Failure indicates a Main Board problem.**

Analog Tests

a. Select the Analog Test Page:
   1. Press *Edit Seq/Preset* until the Edit LED is on but not blinking.
   2. While holding down *Top 9*, quickly press *Bottom 0*.

b. Move the appropriate controller throughout its range and check the following readings:

	Controller	Display	Down	Up	Center
1.	Pitch Wheel	PW=	000	127	064
2.	Mod Wheel	Mod=	000	127	

c. Press *Bottom 1* and check the following:

3.	CV Pedal	CV=	000	127	-
4.	Volume Slider	Vol=	000	127	-

Unplug the CV Pedal and verify that CV=127.

d. Press *Bottom 2* and check the following:

5.	Data Entry Slider	Knob=	000	255
6.	Battery	Bat=	between 29 and 50	

e. Press *Bottom 3* and check the following:

7.	Reference	Reference	between 190 and 210

*** Failure of any of the above tests indicates a Main Board problem or a problem with the associated controller.**

f. Press *Bottom 4* and check the following:

8. Keyboard Mono-Pressure

With no keys pressed: Pressure= 000
With TWO BLACK keys in the center of the keyboard fully pressed: Pressure= 127
With TWO WHITE keys in the center of the keyboard fully pressed: Pressure= 127

NOTE: Repeat this test with both BLACK and WHITE keys on both ends of the keyboard.

*** Failure of the above test indicates a Main Board problem, a keyboard problem or a problem with the mono pressure board.**

Keypad/Display Test *(perform **analog tests step a.** if you have not already entered test mode)*

a. Press *Bottom 5* to activate the LED test. The display will show "LED Test". Verify that the LEDs are properly aligned with the front panel. Check that all the LEDs are the correct colors. The eight track LEDs are RED as are the LEDs above the SELECT SEQ, EDIT SEQ, and EDIT TRACK buttons. The LEDs above the SELECT SOUND, EDIT SOUND, and REPLACE TRACK SOUND buttons are GREEN. The top row of 13 LEDs are YELLOW.

b. Press *Bottom 5* to activate the Lower LCD test. The display will show "LCD Test Lower" with all the segments of the lower half of the display lit.

c. Press *Bottom 5* to activate the Upper LCD test. The display will show "LCD Test Upper" with all the segments of the upper half of the display lit.

d. Press *Bottom 6* to activate the keypad test. The display will show "Press all my buttons please". The buttons can be pressed in any order. As each button is pressed, the button name will be displayed as long as the button is pressed. Verify that all of the buttons are working. When all buttons are pressed the display will show "Success! Thank You!".

e. Press *Bottom 9* to exit the Analog Test Page.

*** Failure of the above test indicates a problem with the keypad/display board**

Audio Quality

a. Press *Select Sound*. Then press *Bank* until the Internal RAM sounds are selected (the display will show "i:INT" in the upper left corner).

b. Select and individually test the following sounds for sound quality, pops, glitches,clicks, reverb, etc. Play each of the following sounds for at least 5 seconds:

INT Bank	Sound#	Sound Name	Effect	
0	7	This goes to 11!	DISTWAH-CHO+REVB	
1	3	Picked Bass	8-VOICE CHORUS	
2	0	StringSection	EQ-CHORUS+REVERB	
3	6	Alto Sax	DUAL EQ+REVERB	
4	8	Solo French Horn	DUAL EQ+REVERB	
5	8	Orchestra	DUAL EQ+REVERB	
6	6	On Golden Pad	EQ-CHORUS+REVERB	**

8	2	AllPurposeKit	EQ-CHORUS+REVERB
7	2	Kalimba	DDL-CHORUS+REVB

** - hold keys down and use mod wheel

c. Press *Bank* until the ROM sounds are selected (the display will show "r:ROM" in the upper left corner), and listen to these sounds also.

ROM Bank	Sound#	Sound Name	Effect	
0	1	Cool B-Three	ROTARY SPKR+REVB	
0	6	Heavenly Voices	DUAL EQ+REVERB	
1	1	Dynamic Grand	DUAL EQ+REVERB	
2	2	Whl/Chorus E Pno	EQ-CHORUS+REVERB	
5	8	Pipe Organ	DUAL EQ+REVERB	
6	9	Sample & Wheel	ENVCF-CHO+REVERB	**
9	0	Standard Kit	EQ-CHORUS+REVERB	***

*** - Lower 7 keys (black & white) and upper 16 keys (black & white) have no sound.
** - Hold keys down and use mod wheel.

*** Failure of the above test indicates a mainboard problem, or a problem with the jack board.**

64 VOICE TEST

To generate 64 voices of polyphony, the KT uses two ENSONIQ OTTO chips connected in serial. When 32 voices are in use in the first OTTO chip, the second OTTO chip starts generating voices. There is a possibility that a customer could complain that thier unit sounds distorted, but only intermittently. This could be a symptom of a defective OTTO chip. To be sure that you have tested both OTTO chips, you must make sure you generate 64 voices

1. Select Rom sound r:ROM 06 Heavenly Voices.
2. Plug the sustain pedal into the footswitch jack.
3. Depress the sustain pedal and keep it depressed.
4. Play the highest key on the keyboard.
5. Starting with the lowest key on the keyboard, play 22 consecutive notes, carefully listenening for any clicks and pops, or distorted output. When you hear that the highest note on the keyboard has stopped playing, you have generated all 64 voices on the OTTO chips.

*** Failure of the above test indicates a mainboard problem.**

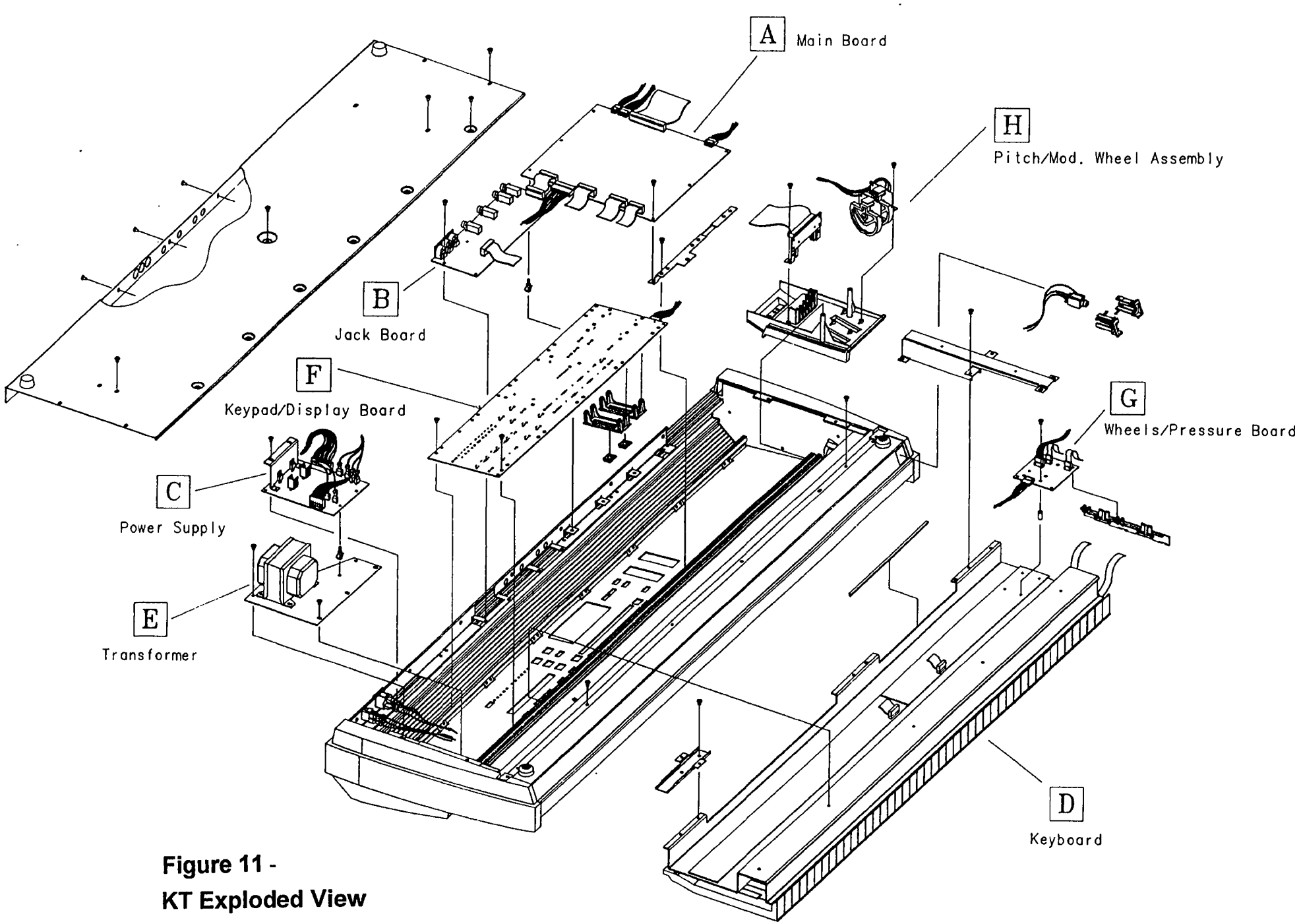


Figure 11 -
KT Exploded View

SECTION
A

Replacing The KT Main Board

Removing-

1. Remove all of the cables connected to the KT including the power cable.
2. Remove the 22 (24 for KT-88) screws from the back panel and bottom cover of the KT. **Note that the 6 (7 for KT-88) screws along the keytip edge are self tapping.** Remove the bottom cover of the KT.
3. Disconnect the cables connected to the main board. **(Note: use a scribe to loosen cable connectors before removing them. All cables are keyed to prevent improper installation.)**
   - The 50 pin PCMCIA memory card cable.
   - The 7 pin display cable.
   - The 4 pin headphone cable.
   - The 6 pin wheel pressure cable.
   - The 16 pin keyboard cable (20 pin on the KT-88).
   - The 20 pin keyboard cable.
   - The 20 pin digital jacks cable.
   - The 20 pin analog jacks cable.
   - The 9 pin power cable.
4. Remove the three screws that connect the main board to the mounting bracket at the front of the case.
5. Using needlenose pliers, depress the clips on the 3 standoffs near the back of the case, and release the main board from the standoffs.
6. Lift the main board straight out to remove the board.

Installing-

7. Place the main board into the unit, aligning it with the 50 pin wave expansion connector towards the front of the unit and the standoff holes aligned over the standoff pins at the rear of the unit.
8. Press the rear of the board down until the standoffs clips snap into place in the holes on the main board.
9. Replace the three screws through the holes at the front of the board that align with the mounting bracket.
10. Reconnect the cables removed in step 3.
11. Reinitialize and test the KT.
12. Replace the bottom cover.

SECTION
B

Replacing The KT Jack Board

Removing-

1. Remove all cables connected to the KT including the power cable.
2. Remove the 22 (24 for KT-88) screws from the back panel and bottom cover of the KT. **Note that the 6 (7 for KT-88) screws along the keytip edge are self tapping.** Remove the bottom cover of the KT.
3. Remove the cables connected to the analog board. **(Note: use a scribe to loosen cable connectors before removing them. All cables are keyed to prevent improper installation.)**
   - The 20 pin digital jacks connector.
   - The 20 pin analog jacks connector.
4. Remove the four screws that hold the jack board to the KT frame.
5. Lift the jack board out of the unit.

Installing-

6. Place the jack board in the KT and align the jacks with the appropriate holes in the KT frame.
7. Replace the 4 screws that hold the jack board in place.
8. Reconnect the cables removed in step 3.
9. Reinitialize and test the KT.
10. Replace the bottom cover.

SECTION
C

Replacing The KT Power Supply

Removing-

1. Remove all cables connected to the KT including the power cable.
2. Remove the 22 (24 for KT-88) screws from the back panel and bottom cover of the KT. **Note that the 6 (7 for KT-88) screws along the keytip edge are self tapping.** Remove the bottom cover of the KT.
3. Remove the cables connected to the power supply board. **(Note: use a scribe to loosen cable connectors before removing them. All cables are keyed to prevent improper installation.)**
   - The orange wire from the power switch.
   - The white wire from the power switch.
   - The blue wire from the power switch.
   - The red wire from the power switch.
   - The green transformer neutral (N) wire.
   - The green transformer Hot wire.
   - The 9 pin power connector.
   - The 6 pin transformer secondary connector.
4. Remove the two screws that connect the power supply heat sink to the KT case.

5. Using needlenose pliers, depress the clips on the 2 standoffs and lift the power supply off of the standoffs.
6. Remove the power supply board from the KT by grasping it by the heat sink and lifting it out of the KT case.

Installing-

7. Place the power supply board into the KT with the heat sink towards the rear of the KT case. Align the holes at the front of the power supply board over the plastic standoffs and press the holes over the standoffs until the clips engage.
8. Replace the screws removed in step 4.
9. Replace the cables removed in step 3.
10. Reinitialize and test the KT.
11. Replace the bottom cover.

SECTION **D**

Replacing The KT Keyboard

Removing-

1. Remove all cables connected to the KT including the power cord.
2. Remove the 22 (24 for KT-88) screws from the back panel and bottom cover of the KT. **Note that the 6 (7 for KT-88) screws along the keytip edge are self tapping.** Remove the bottom cover of the KT.
3. Remove the KT main board (see section A).
4. Remove the pitch /mod. wheel assembly (see section H).
5. Remove the six screws from the metal bracket located over the wheels/pressure board and remove the bracket.
6 Remove the two screws from the metal bracket that connects the KT keyboard to the keyboard frame near the power transformer. Remove the bracket.
7. Remove the 5 black machine screws and washers along the front of the keyboard frame.
8. Slide the keyboard towards the back of the KT and lift it straight up and out of the KT.
9. Remove the wheels/pressure board from the keyboard assembly (see section G).

Installing-

10. Install the wheels/pressure board on the new keyboard assembly (see section G).
11. Place the new keyboard assembly into the KT and slide it forward (be careful to not scratch the keys) aligning the screw holes from step 7. Reinstall the screws removed in step 7.
12. Install the bracket removed in step 5.
13 Install the bracket removed in step 6.
14. Install the pitch/mod. wheel assembly (see section H).
15. Install the KT main board (see section A).
16. Reinitialize and test the KT.
17. Replace the bottom cover.

SECTION
E

Replacing The KT Transformer

Removing-

1. Disconnect all cables from the KT including the power cable.
2. Remove the 22 (24 for KT-88) screws from the back panel and bottom cover of the KT. **Note that the 6 (7 for KT-88) screws along the keytip edge are self tapping.** Remove the bottom cover of the KT.
3. Remove the keyboard from the KT (see section D).
4. Remove the power supply board from the KT (see section C).
5. Remove the 5 screws that hold the transformer bracket to the KT frame.
6. Lift the transformer assembly out of the KT frame.

Installing-

7. Place the KT transformer assembly into the KT frame.
8. Replace the screws removed in step 4.
9. Replace the power supply board (see section C).
10. Replace the keyboard assembly (see section D).
11. Reinitialize and test the KT.
12. Replace the bottom cover on the KT.

SECTION
F

Replacing The KT Keypad/Display Board

Removing-

1. Disconnect all cables from the KT including the power cable.
2. Remove the 22 (24 for KT-88) screws from the back panel and bottom cover of the KT. **Note that the 6 (7 for KT-88) screws along the keytip edge are self tapping.** Remove the bottom cover of the KT.
3. Remove the data entry slider and volume slider knobs.
4. Remove the KT main board (see section A).
5. Remove the KT jack board (see section B).
6. Remove the KT keyboard (see section D).
7. Remove the 10 screws that hold the keypad/display board to the KT frame.
8. Lift the keypad/display board out of the KT.

Installing-

9. Place the new keypad/display board into the KT making sure all of the buttons and slider shafts align with the holes in the front panel of the KT.
10. Replace the screws removed in step 6.
11. Install the KT keyboard (see section D).
12. Install the KT jack board (see section B).
13. Install the KT main board (see section A).
14. Install the volume and data entry slider knobs.
15. Reinitialize and test the KT.

16. Replace the bottom cover.

SECTION G

Replacing The KT Wheels/Pressure Board

Removing-

1. Remove all cables connected to the KT including the power cable.
2. Remove the 22 (24 for KT-88) screws from the back panel and bottom cover of the KT. **Note that the 6 (7 for KT-88) screws along the keytip edge are self tapping.** Remove the bottom cover of the KT.
3. Remove the cables connected to the wheels/pressure board.
   - The 4 pin black keys pressure cable.
   - The 4 pin white keys pressure cable.
   - The 6 pin wheels cable.
   - The 6 pin wheels /pressure cable that connects to the main board.
4. Remove the three screws that hold the wheels/pressure board to the KT keyboard.
5. Take notice of the black plastic bracket attached to the side of the wheels /pressure board. This bracket is used to route the pressure strip cables to the wheels/pressure board properly. Use a scribe to release this bracket from the wheels/pressure board.
6. Lift the wheels/pressure board out of the KT.
7. There are three white plastic standoffs connected to the mounting holes on the wheels/pressure board. Remove these standoffs from the wheels/pressure board and retain them for installation on the replacement wheels/pressure board.

Installing-

8. Install the standoffs retained in step 7 into the proper holes on the replacement wheels/pressure board.
9. Place the wheels/pressure board in place over the KT keyboard assembly, and snap the black plastic retaining bracket in place on the wheels/pressure board.
10. Replace the screws removed in step 4.
11. Replace the cables remove in step 3.
12. Reinitialize and test the KT.
13. Replace the bottom cover.

SECTION H

Replacing The KT Pitch/Mod. Wheel Assembly

Removing

1. Remove all cables connected to the KT including the power cable.
2. Remove the 22 (24 for KT-88) screws from the back panel and bottom cover of the KT. **Note that the 6 (7 for KT-88) screws along the keytip edge are self tapping.** Remove the bottom cover of the KT.
3. Remove the 50 pin PCMCIA cable from the PCMCIA card on the Pitch/Mod. Wheel assembly.
4. Remove the 6 pin Wheels connector from the Wheels /Pressure board.
5. Remove the 2 screws from the back of the Pitch/Mod. Wheel assembly.

6. Looking at the bottom of the KT, with the keys facing away from you, locate the second and third screws in from the top left corner. Remove these 2 screws.
7. Turn the KT right side up and grasp the Pitch/Mod. Wheel assembly by the wheels.
8. Lift the Pitch/Mod. Wheel assembly out of the KT case.

Installing

9. Place the new Pitch/Mod. Wheel assembly into the KT case and turn the KT up side down.
10. Replace the screws removed in steps 5 and 6.
11. Replace the cables removed in steps 3 and 4.
12. Ensure the Pitch and Mod. Wheels range of motion is not inhibited by any cables.
13. Reinitialize and test the KT.
14. Replace the bottom cover.

KT MODULES AND THEIR PART NUMBERS

Main Board	4090023501	KT-76
Main Board	4090026001	KT-88
Keypad/Display Board	4090023601	KT-76/88
Jack Board	4090023701	KT-76/88
Wheels/Pressure Board	4090023801	KT-76/88
Power Supply Board	4090023901	KT-76/88
Transformer Assembly 115V	1450000902	KT-76/88
Transformer Assembly 230V	1450000552	KT-76/88
Keyboard, 76 Note	6120763201	KT-76
Keyboard, 88 Note	6120881201	KT-88

Prices and exchange rates for these modules are found in the ENSONIQ schedule.

NOTES

ENSONIQ Customer Service

Hours:	Monday through Friday 9:30 AM to 6:30 PM Eastern Time Closed for lunch 12:15 PM to 1:15 PM
Parts ordering:	U.S. ☎1-800-441-1003 (Confidential) Canada ☎1-514-633-8877
ENSONIQ Fax:	1-610-647-8908
Customer Tech Support:	1-610-647-3930*

***This is the phone number to give customers that want to contact ENSONIQ directly (U.S.A).**

Use the ENSONIQ Automatic Fax Retrieval System: 1-800-257-1439

When contacting ENSONIQ Customer Service, please have the following information ready:

- ☞ Model Number,
- ☞ Serial Number,
- ☞ Operation System Version,
- ☞ Warranty Status, and
- ☞ Your Purchase Order Number when ordering parts.

ENSONIQ™

LEADING THE WORLD IN SOUND INNOVATION

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